

Commencing with January 1, 1916, new daily normals of the total solar and sky radiation have been employed. These have been determined in the same way as those previously used,¹¹ except that they are based exclusively on the data obtained at the central office of the Weather Bureau between July, 1909, and April, 1912, and at the American University between November 1, 1914, and the end of the current month.

In Table 4 are given the daily totals of radiation, the departures from the five-year daily normals determined as above, and the accumulated deficiency of radiation during the month. The latter shows an average deficiency of about 20 calories per day during the first two decades, but very nearly the normal amount of radiation during the third decade.

It will be seen from the sums of the daily totals and departures of radiation that the new normals are slightly lower than those published in the REVIEW for March, 1915, 43:106, Table 4.

TABLE 4.—Daily totals and departures of solar and sky radiation at Washington, D. C., during January, 1916.

[Gram-calories per square centimeter of horizontal surface.]

Day of month.	Daily totals.	Departures from normal.	Excess or deficiency since first of month.
	Gr.-cal.	Gr.-cal.	Gr.-cal.
Jan. 1.....	39	-121	-121
2.....	118	-42	-163
3.....	224	63	-100
4.....	210	49	-51
5.....	175	13	-38
6.....	148	-14	-52
7.....	76	-87	-139
8.....	233	69	-70
9.....	150	-14	-84
10.....	58	-107	-191
11.....	30	-136	-327
12.....	25	-142	-469
13.....	101	-67	-536
14.....	206	37	-499
15.....	204	34	-465
16.....	87	-84	-549
17.....	235	62	-487
18.....	224	50	-437
19.....	286	110	-327
20.....	96	-81	-408
Decade departure.....			-217
21.....	222	43	-365
22.....	74	-106	-471
23.....	260	78	-393
24.....	275	92	-301
25.....	212	27	-274
26.....	187	0	-274
27.....	202	13	-261
28.....	201	9	-252
29.....	142	-52	-304
30.....	64	-133	-437
31.....	216	16	-421
Decade departure.....			-13
Deficiency since first of year.....	[Gram-calories.....]		421
	[Per cent.....]		7.3

SOLAR RADIATION MEASUREMENTS AT LINCOLN, NEBR., 1911-1915.

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[Dated: Weather Bureau, Washington, Feb. 19, 1916.]

The first solar radiation measurements at Lincoln, Nebr., were made by the writer in August, 1910, with Smithsonian silver-disk pyrheliometer No. 1. Regular observations were not commenced until November, 1911,

when Marvin pyrheliometer No. 3, of the spiral ribbon type, was installed at the Weather Bureau office in the Brace Physical Laboratory, University of Nebraska. This laboratory is on the university campus, just north of the business section of Lincoln, and but a few blocks east of extensive railroad yards. In consequence, there is considerable smoke in the atmosphere, especially in winter, except when strong northwest winds prevail.

For the exposure of the pyrheliometer during observations, shelves were erected outside a south and a west third-story window of the laboratory. During the winter the sun could be observed from the south window at any hour of the day. During late afternoon hours in summer it could be observed from the west window, but both windows were in the shade during the early morning hours at this season.

The Marvin pyrheliometer has been compared from time to time with Smithsonian silver-disk pyrheliometer No. 1, and the results are summarized in Table 1. They do not indicate that the instrument has undergone any change, except that its coefficient of absorption was brought up to its original value by re-sooting on July 13, 1915.

Practically all the radiation measurements at the Weather Bureau office were made by Mr. G. A. Loveland, in charge of station, or by Mr. H. G. Carter, the first assistant. These measurements are summarized in Table 2 (City Station). On account of the small number of measurements obtained, seasonal means have been computed instead of monthly means. They are lower than are corresponding seasonal means for Madison, Wis., computed from the monthly means given in this number of the REVIEW, pages 9-12. This is probably because of the smokiness of the atmosphere at Lincoln.

The latitude of the Weather Bureau office at Lincoln is 40° 49' N., its longitude is 96° 45' W., and the elevation of the pyrheliometer above sea level was 1,190 feet, or 363 meters.

At the end of June, 1915, the Marvin pyrheliometer was transferred from the Weather Bureau office to the State Experiment Station building, on the farm campus at the State University Farm. This is just outside the city limits of Lincoln and about 2½ miles northeast of the Weather Bureau office. The latitude at this place is about 40° 50' N., the longitude 96° 41' W., and the elevation of the pyrheliometer above sea level 1,225 feet, or 373 meters. For details relative to this new exposure of the instrument (Farm Station) the reader is referred to this number of the REVIEW, page 2.

Practically all the pyrheliometric readings at the State University Farm have been made by Mr. Carl T. Hilmers, Assistant Observer, Weather Bureau. Those for the latter half of 1915 are summarized in Table 3. Comparison with Table 2 shows that these readings are markedly higher than those previously obtained during corresponding months at the Weather Bureau office, and except in August and September the monthly means are higher than those for Madison, above referred to. The highest readings obtained in each of the six months exceed the highest readings that have been obtained at Madison in the corresponding months in any year. It is therefore evident that radiation measurements obtained at the State University Farm at Lincoln, Nebr., must be treated as a new series, and not as a continuation of the series obtained at the Weather Bureau office.

¹¹ See the REVIEW for March, 1915, 43:101.

TABLE 1.—Comparison of pyrheliometers at Lincoln, Nebr.

Date.	Smith-sonian No. 1.	Marvin No. 3.	Ratio, Marvin-Smithsonian.	Date.	Smith-sonian No. 1.	Marvin No. 3.	Ratio, Marvin-Smithsonian.
1911.				1915.			
Aug. 21.....	1.277	1.269	0.994	July 9.....	1.267	1.260	0.993
22.....	1.328	1.311	0.987	10.....	1.371	1.341	0.978
Sept. 14.....	1.384	1.367	0.988	10.....	1.294	1.270	0.981
1912.				10.....	1.183	1.158	0.979
Apr. 8.....	1.423	1.472	1.034	11.....	1.317	1.306	0.992
8.....	1.420	1.432	1.008	11.....	1.203	1.198	0.996
9.....	1.332	1.350	1.013	11.....	1.021	1.009	0.988
9.....	1.342	1.355	1.010	12.....	1.181	1.170	0.991
9.....	1.077	1.111	1.032	12.....	1.071	1.058	0.988
12.....	1.299	1.308	1.007	15.....	*1.051	*1.080	*1.025
Oct. 13.....	1.080	1.054	1.023	15.....	1.207	1.212	1.004
12.....	1.174	1.204	1.025	15.....	1.279	1.281	1.002
12.....	1.253	1.238	0.998	15.....	1.315	1.300	0.989
12.....	1.169	1.187	1.015	15.....	1.252	1.232	0.984
				15.....	1.116	1.112	0.996
				15.....	1.019	1.017	0.998
				15.....	0.832	0.822	0.988
				17.....	1.287	1.275	0.991
				18.....	0.859	0.854	1.018
				20.....	1.025	1.004	1.038
				20.....	1.184	1.217	1.028
				20.....	1.291	1.323	1.025
				20.....	1.350	1.363	1.010
				20.....	1.295	1.284	0.993
				20.....	1.197	1.219	1.018

* Surface of Marvin instrument re-sooted on July 13.

TABLE 2.—Solar radiation intensities at Lincoln, Nebr. (City Station).

[Gram-calories per minute per square centimeter of normal surface.]

Dates.	Sun's zenith distance.									
	0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.3°	79.8°
	Air mass.									
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
	Gr.-cal.	Gr.-cal.	Gr.-cal.	Gr.-cal.	Gr.-cal.	Gr.-cal.	Gr.-cal.	Gr.-cal.	Gr.-cal.	Gr.-cal.
Aug. 1910.	1.31	1.16	1.04	0.92	0.82	0.73				
20.....	1.04									
21.....	1.15									
24.....	1.26									
June 1913.										
11.....	1.17									
12.....	1.20									
13.....	1.17									
23.....	1.20									
26.....	1.24									
27.....	1.29									
July 16.....	1.20	1.02								
17.....	1.23	0.91								
21.....	1.31									
Aug. 14.....		1.11								
27.....		1.03								
June 1914.										
9.....	1.38									
18.....	1.35									
23.....	1.28									
24.....	1.30									
July 2.....	1.37									
8.....	1.36									
Aug. 4.....	1.13	1.02								
5.....	1.28	1.05								
12.....	1.80	1.04								
25.....	1.35	1.07								
Means (summer).....	1.27	1.05	(1.04)	(0.92)	(0.82)	(0.73)				
Nov. 1911.										
10.....			1.19	1.11	1.04					
12.....			1.42	1.34						
14.....			1.29	1.14						
14.....			1.16	1.12	1.09	0.94				
15.....			1.32	1.22			0.98			
15.....			1.19	1.11						
17.....				1.21						
23.....					0.96					
24.....			1.27				0.95			
29.....				1.22						
29.....				1.37						

TABLE 2.—Solar radiation intensities at Lincoln, Nebr. (City Station)—Continued.

[Gram-calories per square centimeter of normal surface.]

Date.	Sun's zenith distance.									
	0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.3°	79.8°
	Air mass.									
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
	Gr.-cal.	Gr.-cal.	Gr.-cal.	Gr.-cal.	Gr.-cal.	Gr.-cal.	Gr.-cal.	Gr.-cal.	Gr.-cal.	Gr.-cal.
Oct. 1912.										
12.....	1.27	1.13	1.00	0.91						
12.....	1.25	1.12	1.00	0.90	0.82	0.75	0.68	0.55		
15.....	1.16									
17.....	1.18									
18.....	1.22									
22.....	1.20									
25.....	1.15									
26.....	1.18									
29.....	1.23									
Nov. 13.....		1.15								
15.....		1.02								
18.....		1.14								
18.....		1.14								
19.....		1.00								
21.....		1.23	1.14	1.06	0.97				0.68	
21.....		1.25	1.00	0.78	0.65	0.59			0.49	0.45
25.....			1.03							
29.....			1.06							
Sept. 1913.										
26.....	1.27									
26.....	1.38									
Oct. 22.....		1.18								
25.....			1.08							
Sept. 1914.										
1.....	1.03									
3.....	1.17	1.04								
18.....		0.97								
18.....	1.21	1.15	1.08							
24.....	1.37	1.27	1.08							
24.....		1.27	0.90							
30.....	1.13	0.99	0.87	0.80						
30.....	1.22	1.11	1.02							
Oct. 16.....	1.42	1.27								
16.....		1.28	1.19	1.12				0.89	0.82	
20.....				0.90						
27.....		1.37	1.22							
27.....		1.39	1.27	1.16	1.06	0.97			0.80	
29.....	1.44	1.33	1.22							
29.....		1.35	1.20	1.07	1.07	0.95			0.77	
Nov. 6.....		1.38	1.18	1.05						
6.....		1.37	1.26	1.14	1.00	0.94	0.90			
Means (fall).....	1.24	1.21	1.14	1.03	0.94	0.86	0.86	0.68	(0.45)	
Dec. 1911.										
4.....			1.21							
4.....			1.21							
5.....			1.18			1.02				
27.....			1.32							
Jan. 1912.										
18.....		1.42								
Feb. 27.....		1.38								
Dec. 4.....			1.00							
6.....			0.92							
9.....			1.08							
10.....			1.10							
12.....			1.05							
12.....			1.06							
13.....			0.67							
19.....			1.00	0.88					0.59	
20.....			0.99		0.78			0.64	0.57	
23.....			1.09	1.00	0.87	0.81			0.70	0.65
26.....			1.05							
27.....			0.92							
28.....			1.07							
31.....			1.14	0.96	0.87					
Jan. 1913.										
9.....			1.12							
15.....			1.02							
15.....			1.08							
Feb. 7.....			1.19							
7.....			1.24							
Dec. 10.....				1.20	1.09					
Jan. 1914.										
24.....					1.18					
26.....					0.97	0.75				
29.....			1.30	1.09		0.97	0.89		0.67	0.62

TABLE 2.—Solar radiation intensities at Lincoln, Nebr. (City Station)—Continued.

[Gram-calories per square centimeter of normal surface.]

Date.	Sun's zenith distance.										
	0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.3°	79.8°	80.7°
	Air mass.										
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
1914.	Gr-cal.	Gr-cal.	Gr-cal.	Gr-cal.	Gr-cal.	Gr-cal.	Gr-cal.	Gr-cal.	Gr-cal.	Gr-cal.	Gr-cal.
Feb. 7.			1.26	1.13							
17.			1.30		1.05						
24.		1.42	1.28	1.05							
Means (winter).		(1.40)	1.23	1.07	0.99	0.92	(0.85)	(0.64)	0.63	(0.64)	
1912.											
Apr. 8.		1.39									
8.		1.42									
9.		1.42	1.30								
9.			1.18								
10.			1.08	0.99	0.93	0.87	0.82	0.76	0.68		
11.			1.06	0.95							
11.		1.18	1.06								
11.		1.25									
22.	1.46	1.31	1.14								
24.	1.25	1.18									
May 6.	1.40	1.03	0.75								
8.		1.38									
8.	1.41	1.30	1.21								
15.		1.33									
16.		1.31									
21.	1.32										
24.	1.28	1.10	1.01	0.97							
1913.											
Mar. 5.		1.24									
11.		1.29		0.99	0.82						
21.		1.26	1.10								
27.		1.12	0.99								
28.		1.05									
Apr. 11.		1.18									
17.		1.24	1.08	0.92							
26.			1.07								
May 6.		1.19									
23.	1.26	1.00									
27.	1.25	1.12									
1914.											
Mar. 5.		1.40	1.28								
23.		1.26	1.08								
23.		1.26									
Apr. 8.	1.53	1.39	1.22								
14.		1.17	1.05								
May 13.		1.26									
13.		1.29									
14.		1.12									
1915.											
Mar. 31.		1.26									
Apr. 1.		1.33									
2.		1.39	1.25	1.12							
3.		1.37	1.24	1.12	1.01	0.92					
5.		1.33									
29.	1.24	1.20									
May 11.	1.34										
Means (spring).	1.36	1.25	1.10	1.01	0.92	(0.90)	(0.82)	(0.76)	(0.68)		

TABLE 3.—Solar radiation intensities at Lincoln, Nebr. (State University farm).

[Gram-calories per minute per square centimeter of normal surface.]

Date.	Sun's zenith distance.										
	0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°	80.7°
	Air mass.										
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
1915.	Gr-cal.	Gr-cal.	Gr-cal.	Gr-cal.	Gr-cal.	Gr-cal.	Gr-cal.	Gr-cal.	Gr-cal.	Gr-cal.	Gr-cal.
July 3.	1.36	1.22	1.12	1.06	0.99	0.93	0.77				
4.		1.31	1.26	1.21	1.16						
5.	1.37	1.27									
6.	1.32	1.21	1.11	0.99	0.89						
7.				1.02	0.91						
9.	1.30										
15.	1.33	1.20	1.08								
16.	1.37										
17.		1.24	1.15								
18.					0.86	0.79					
20.		1.34	1.27	1.18	1.11	1.04	0.98	0.92			
21.	1.43	1.31	1.25	1.16	1.06	0.97	0.90	0.82			
22.	1.38	1.27	1.17	1.08	1.02	0.96	0.88				
31.				1.02							
Means.	1.36	1.26	1.13	1.10	1.04	0.94	0.86	(0.87)			
P. M.											
July 5.		1.24	1.13	1.05	0.97						
9.		1.12									
10.	1.38	1.28	1.19	1.10							
11.	1.33	1.20	1.06	0.94	0.82						
12.	1.34	1.18	1.09	1.00	0.89						
15.		1.12	1.00	0.87	0.73						
17.		1.14	0.97	0.87	0.80	0.72	0.66				
18.			1.00								
20.	1.42	1.32	1.22	1.16	1.09						
21.		1.18	1.09	1.01	0.97	0.90	0.86				
23.	1.38	1.16									
29.	1.35	1.17	1.05								
30.	1.35		1.08	1.00	0.93	0.86					
Means.	1.36	1.19	1.09	1.01	0.91	0.85	(0.78)	(0.66)			
A. M.											
Aug. 5.		1.22	1.11								
6.						0.67	0.60				
10.		0.68	0.58	0.48	0.41	0.35					
11.		0.97	0.86	0.75	0.65	0.58	0.54	0.50			
12.		1.06	0.93								
13.			0.94	0.83	0.71	0.59					
14.		1.08	0.93	0.81							
20.					0.79	0.71					
21.		0.97	0.90	0.80	0.66	0.59	0.53				
22.		1.04	0.94	0.82	0.70		0.56	0.50	0.44		
24.			0.89		0.63	0.56	0.50	0.41			
29.		1.31	1.18	1.09	1.02	0.95	0.89	0.83			
30.		1.33	1.23	1.13	1.07	0.98					
31.			1.26	1.17	1.12	1.06	0.99				
Means.		1.07	0.98	0.88	0.78	0.71	0.67	0.57	(0.44)		
P. M.											
Aug. 5.		1.20	1.11	1.02	0.93	0.84	0.78	0.77			
6.	1.31										
10.	0.93						0.40				
12.	1.16	0.99	0.84	0.71	0.62	0.55	0.49	0.44			
14.		1.04	0.99	0.81							
16.	1.24										
19.	1.25				0.68	0.63	0.55	0.53			
20.		1.19	1.08	0.98	0.91	0.82	0.75		0.62	0.57	
21.	1.16	0.99									
22.			1.09	0.97	0.86						
24.	1.34	1.24	1.14	1.04	0.96	0.80	0.83		0.72	0.68	0.64
27.					0.98						
29.			1.23	1.15	1.08	1.01	0.95	0.90	0.84	0.79	
30.	1.42	1.24	1.10	1.00	0.92	0.85	0.78	0.73	0.71	0.67	
31.	1.43	1.32	1.18	1.08							
Means.	1.25	1.15	1.07	0.97	0.87	0.82	0.70	0.67	0.63	0.63	(0.64)
A. M.											
Sept. 2.		1.28	1.19	1.12	1.03	0.95					
4.		0.94	0.85	0.73			0.46	0.40			
5.		0.92	0.73	0.62	0.52	0.45	0.40	0.37			
7.		1.26	1.12	1.00			0.89	0.79	0.70		
8.					0.86	0.81	0.76	0.72	0.69		
17.		1.21	1.07								
18.		1.33	1.24								
21.		1.44									
22.			1.22	1.14	1.06	0.98	0.91	0.83			
Means.		1.20	1.06	0.92	0.87	0.80	0.65	0.58	(0.69)		
P. M.											
Sept. 1.		1.29	1.20	1.11	1.03	0.96	0.89	0.84	0.78		
2.	1.39	1.26	1.05	1.00	0.92	0.84	0.75	0.67	0.63		
5.		1.07									
7.		1.34	1.17	1.06							
9.		1.33	1.25	1.11	1.05	0.96	0.88	0.80	0.72	0.64	
12.				1.01		0.75					

TABLE 3.—*Solar radiation intensities at Lincoln, Nebr. (State University farm)—Continued.*

[Gram-calories per minute per square centimeter of normal surface.]

Date.	Sun's zenith distance.									
	0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass.									
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
1915.	<i>Gr.-cal.</i>	<i>Gr.-cal.</i>	<i>Gr.-cal.</i>	<i>Gr.-cal.</i>	<i>Gr.-cal.</i>	<i>Gr.-cal.</i>	<i>Gr.-cal.</i>	<i>Gr.-cal.</i>	<i>Gr.-cal.</i>	<i>Gr.-cal.</i>
Sept. 16.	1.43	1.33	1.24	1.15	1.07	1.00	0.94	0.90	0.87	0.84
18.	1.10	1.10	1.04	0.97	0.91	0.87	0.84	0.81	0.78	0.75
19.	1.10	1.10	1.04	0.97	0.91	0.87	0.84	0.81	0.78	0.75
20.	1.40	1.32	1.24	1.15	1.07	1.00	0.94	0.90	0.87	0.84
21.	1.40	1.28	1.17	1.08	0.99	0.92	0.86	0.81	0.77	0.73
22.	1.27	1.13	1.01	0.91	0.83	0.76	0.69	0.64	0.61	0.58
27.	1.26	1.15	1.05	0.97	0.91	0.84	0.77	0.71	0.67	0.63
29.	1.27	1.13	1.01	0.91	0.83	0.76	0.69	0.64	0.61	0.58
Means.	1.31	1.27	1.15	1.06	0.93	0.88	0.83	0.74	0.69	(0.72)
A. M.										
Oct. 2.	1.22	1.10	1.01	0.92	0.84	0.77	0.71	0.67	0.63	0.60
5.	1.44	1.32	1.21	1.12	1.02	0.94	0.86	0.81	0.77	0.73
7.	1.51	1.44	1.37	1.30	1.23	1.17	1.11	1.06	1.01	0.97
8.	1.51	1.44	1.37	1.30	1.23	1.17	1.11	1.06	1.01	0.97
9.	1.51	1.44	1.37	1.30	1.23	1.17	1.11	1.06	1.01	0.97
10.	1.37	1.32	1.24	1.15	1.07	1.00	0.94	0.90	0.87	0.84
13.	1.34	1.32	1.24	1.15	1.07	1.00	0.94	0.90	0.87	0.84
17.	1.35	1.27	1.19	1.13	1.07	1.00	0.94	0.89	0.85	0.81
18.	1.27	1.19	1.10	1.01	0.92	0.84	0.77	0.71	0.67	0.63
21.	1.29	1.21	1.14	1.06	0.99	0.92	0.86	0.81	0.77	0.73
22.	1.30	1.25	1.18	1.08	0.99	0.92	0.86	0.81	0.77	0.73
23.	1.37	1.30	1.22	1.16	1.09	1.02	0.94	0.87	0.81	0.77
27.	1.35	1.27	1.19	1.13	1.07	1.00	0.94	0.89	0.85	0.81
29.	1.43	1.35	1.27	1.13	1.00	0.94	0.87	0.79	0.73	0.69
Means.	1.36	1.29	1.22	1.16	1.06	0.99	0.91	0.79	0.73	0.69
P. M.										
Oct. 2.	1.22	1.10	1.01	0.92	0.84	0.77	0.71	0.67	0.63	0.60
3.	1.44	1.35	1.27	1.19	1.12	1.05	0.99	0.93	0.88	0.84
5.	1.44	1.35	1.27	1.19	1.12	1.05	0.99	0.93	0.88	0.84
8.	1.51	1.42	1.34	1.28	1.21	1.16	1.11	1.06	1.02	0.97
9.	1.51	1.42	1.34	1.28	1.21	1.16	1.11	1.06	1.02	0.97
13.	1.34	1.23	1.15	1.08	1.01	0.96	0.90	0.82	0.77	0.73
17.	1.35	1.27	1.19	1.13	1.07	1.00	0.94	0.89	0.85	0.81
21.	1.29	1.21	1.14	1.06	0.99	0.92	0.86	0.81	0.77	0.73
22.	1.30	1.25	1.18	1.08	0.99	0.92	0.86	0.81	0.77	0.73
26.	1.37	1.30	1.22	1.16	1.09	1.02	0.94	0.87	0.81	0.77
27.	1.35	1.27	1.19	1.13	1.07	1.00	0.94	0.89	0.85	0.81
29.	1.43	1.35	1.27	1.13	1.00	0.94	0.87	0.79	0.73	0.69
Means.	1.41	1.35	1.25	1.15	1.10	1.06	0.95	0.90	0.85	0.80
A. M.										
Nov. 1.	1.30	1.20	1.11	1.00	0.91	0.84	0.77	0.71	0.67	0.63
8.	1.40	1.30	1.14	1.03	0.96	0.90	0.84	0.79	0.74	0.69
12.	1.40	1.30	1.14	1.03	0.96	0.90	0.84	0.79	0.74	0.69
14.	1.34	1.24	1.15	1.08	1.01	0.96	0.90	0.82	0.77	0.73
21.	1.47	1.41	1.34	1.28	1.23	1.17	1.12	1.06	1.01	0.97
26.	1.43	1.33	1.24	1.16	1.09	1.02	0.94	0.87	0.81	0.77
29.	1.45	1.36	1.30	1.22	1.17	1.12	1.06	1.01	0.97	0.93
Means.	1.44	1.41	1.31	1.22	1.13	1.08	1.00	0.95	0.90	0.85
P. M.										
Nov. 1.	1.30	1.20	1.11	1.00	0.91	0.84	0.77	0.71	0.67	0.63
11.	1.42	1.36	1.23	1.18	1.13	1.07	1.01	0.95	0.90	0.85
12.	1.37	1.29	1.22	1.14	1.07	1.00	0.94	0.89	0.85	0.81
19.	1.43	1.36	1.30	1.25	1.19	1.13	1.07	1.01	0.95	0.90
21.	1.52	1.44	1.37	1.30	1.23	1.17	1.12	1.06	1.01	0.97
26.	1.50	1.29	1.16	1.07	1.01	0.95	0.89	0.84	0.79	0.74
28.	1.49	1.45	1.37	1.31	1.25	1.19	1.14	1.09	1.04	0.99
29.	1.54	1.45	1.37	1.31	1.25	1.19	1.14	1.09	1.04	0.99
Means.	1.45	1.34	1.25	1.18	1.11	1.07	1.02	1.03	0.98	(0.93)
A. M.										
Dec. 4.	1.30	1.23	1.14	1.09	1.02	0.92	0.86	0.81	0.77	0.73
8.	1.41	1.29	1.21	1.13	1.07	1.00	0.94	0.89	0.85	0.81
13.	1.36	1.26	1.17	1.10	1.02	0.95	0.89	0.84	0.79	0.74
17.	1.38	1.31	1.23	1.17	1.10	1.02	0.95	0.89	0.84	0.79
20.	1.42	1.34	1.24	1.13	1.07	1.00	0.94	0.89	0.85	0.81
21.	1.36	1.32	1.24	1.12	1.06	1.00	0.94	0.89	0.85	0.81
28.	1.50	1.41	1.32	1.22	1.17	1.12	1.06	1.01	0.97	0.93
Means.	1.36	1.36	1.29	1.20	1.09	1.02	0.95	0.90	0.85	0.80
P. M.										
Dec. 3.	1.30	1.28	1.17	1.11	1.06	1.00	0.94	0.89	0.85	0.81
4.	1.21	1.10	1.02	0.93	0.86	0.81	0.76	0.71	0.67	0.63
8.	1.35	1.25	1.17	1.10	1.02	0.95	0.89	0.84	0.79	0.74
17.	1.38	1.31	1.23	1.17	1.10	1.02	0.95	0.89	0.84	0.79
21.	1.35	1.29	1.24	1.19	1.14	1.09	1.04	0.99	0.94	0.89
28.	1.50	1.41	1.32	1.22	1.17	1.12	1.06	1.01	0.97	0.93
Means.	1.30	1.24	1.18	1.14	1.15	(1.10)	(0.86)	(0.81)	(0.76)	(0.71)

SOLAR RADIATION MEASUREMENTS AT MADISON, WIS., 1913-1915.

By HERBERT H. KIMBALL, Professor of Meteorology, and ERIC R. MILLER, Local Forecaster.

[Dated: Washington, D. C., Feb. 15, 1916.]

The radiation measurements summarized in Table 3 below are in continuation of those for the period July, 1910, to June, 1912, inclusive, published in the Bulletin of the Mount Weather Observatory, 1912, 5:177-181. These latter are included on the monthly means of Table 3, which are the arithmetical means of all the A. M. or P. M. published measurements at the respective air masses for months of the same name.

The means here given are generally lower than those summarized in the Bulletin above referred to, p. 182, Table 2, and especially during the early months of the year. This is no doubt due in part to the marked depression in radiation intensities during the latter part of 1912 and most of 1913, following the eruption of Katmai volcano in Alaska in June, 1912.¹ Undoubtedly, however, the occasions are rare when such high values as those of the early months of 1911 and 1912 will be measured at Madison, since the atmosphere at that place is apt to be more or less smoky, especially during the winter months.

TABLE 1.—*Comparison of radiation intensities measured at different stations with exceptionally clear skies.*

[Gram-calories per minute per square centimeter of normal surface.]

Station.	Date.	Air mass.					
		1.5	2.0	2.5	3.0	3.5	4.0
		<i>Gr.-cal.</i>	<i>Gr.-cal.</i>	<i>Gr.-cal.</i>	<i>Gr.-cal.</i>	<i>Gr.-cal.</i>	<i>Gr.-cal.</i>
Madison, Wis.	Sept. 4, 1914.	1.37	1.29	1.18	1.08	1.01	0.94
Mount Weather, Va.	Sept. 28, 1914.	1.48	1.40	1.32	1.26	1.20	1.14
Madison, Wis.	Dec. 30, 1914.	1.47	1.37	1.31	1.24	1.18	1.12
Washington, D. C.	Dec. 26, 1914.	1.61	1.42	1.32	1.24	1.18	1.12
Madison, Wis.	Dec. 28, 1915.	1.46	1.40	1.32	1.25	1.18	1.12
Lincoln, Nebr.	do.	1.50	1.40	1.38	1.32	1.26	1.20
Santa Fe, N. Mex.	Dec. 24, 1915.	1.59	1.53	1.43	1.35	1.30	1.25

On December 30, 1914, and December 28, 1915, the highest December radiation intensities of record at Madison were obtained, and on September 4, 1914, the highest September intensities. It is of interest to compare these with intensities at other stations at about the same time, as has been done in Table 1. The intensities measured at Mount Weather, Va., on September 28, 1914, are the highest September intensities ever measured at the station. Likewise, those for Washington on December 26, 1914, are the highest intensities for corresponding air masses measured at Washington in any month. This is also true of the measurements at Lincoln, Nebr., on December 28, 1915, while those obtained at Santa Fe on December 24, 1915, are the highest December radiation intensities yet measured at that station.

Marvin pyrheliometer No. 5, of the spiral-ribbon type, which became the station instrument at Madison on November 24, 1911, has been in continuous use since that date. It was recompared with Smithsonian silver-disk pyrheliometer No. 1 during March and April, 1912, and again in March, 1915. The results are given below in

¹ See Bulletin of the Mount Weather Observatory, 1914, 6:208, figure 1, for a graphic presentation of this depression.